

2023-2024 ACADEMIC YEAR

Mawlamyine, Mon State

Grade 12
Chemistry

September Monthly Test
Time Allowed (1:30) hours

SECTION (A)

(Answer All Questions)

1. Write TRUE or FALSE for each of the following statements. **(5 marks)**
 - (a) The rates of chemical reactions are increased by the catalysts raising the activation energy of the reactions.
 - (b) Total enthalpy change for a chemical reaction is dependent on the route by which the reaction takes place.
 - (c) A rate is always expressed as a positive quantity.
 - (d) An endothermic process may be used as a cooling system.
 - (e) The moles of gases are greatly affected by pressure.
2. Fill in the blanks with the correct word(s), notation(s), term(s), unit(s), etc, as necessary. **(5 marks)**
 - (a) The _____ energy required to form the activated complex is called the activation energy.
 - (b) The correct _____ of reactant molecules leads to the formation of products.
 - (c) Heat liberated by a chemical reaction is assigned by _____.
 - (d) When the energy needed to break bonds is _____ the energy needed to form bonds, the reaction exothermic.
 - (e) More molecules have sufficient energy to react, so the _____ of reaction is increased.
3. Select the correct word or words given in the brackets. **(5 marks)**
 - (a) The experimental unit for the rate of formation of hydrogen gas collected in the syringes is (A. g min^{-1} , B. $\text{mol dm}^{-3} \text{ min}^{-1}$, C. $\text{cm}^3 \text{ min}^{-1}$).
 - (b) (A. Collision with enough energy, B. Every collision, C. Collision with low energy) leads to the chemical reaction to proceed.
 - (c) The bond forming is a/an (A. exothermic, B. endothermic, C. heat evolving) process.
 - (d) The solution is very dilute, its specific heat capacity is taken to be (A. same, B. different, C. less) as that of water.
 - (e) The rate of reaction is (A. directly proportional, B. equal, C. inversely proportional) to the concentration of the solution.

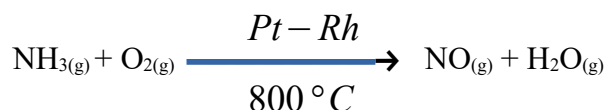
SECTION (B)

4. Answer the followings. **(10 marks)**
 - (a) Define the standard enthalpy change of formation.
 - (b) What do you understand specific heat capacity?
 - (c) What is the difference between a homogeneous catalyst and a heterogeneous catalyst? Give one example for each.
 - (d) Name the theory that is used to explain the rate of reaction.
 - (e) What do you understand collision theory.

5. Answer All Questions.

(10 marks)

- (a) A 75 cm^3 of 2.0 mol dm^{-3} ethanoic acid, CH_3COOH was placed in a styrofoam cup. The temperature was 18.2°C . A 75 cm^3 of 2.0 mol dm^{-3} ammonium hydroxide, NH_4OH temperature was 18.6°C . After mixing these solutions, the highest temperature was 31.0°C . Calculate ΔH for the neutralization. ($c = 4.18 \text{ Jg}^{-1}\text{C}^{-1}$)
- (b) Three reactions A,B, and C have activation energies of 8,10 and $15 \text{ k cal mol}^{-1}$, respectively. Which of these reactions will occur most rapidly at 25°C ? Explain your answer.
- (c) In the Ostward process for manufacturing nitric acid and ammonia oxidation occurs slowly as the following reaction.



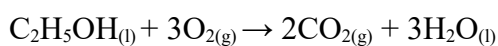
- (i) Write down the balanced chemical equation for the reaction.
- (ii) Which factors affect the speed of this reaction?
- (iii) Which type of catalyst is Pt-Rh in this reaction?

(d) List the factors that affect the rate of reactions.

6. Answer All Questions.

(15 marks)

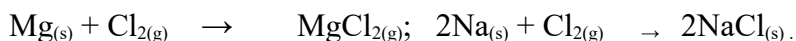
- (a) Calculate the enthalpy change of the combustion (ΔH_c) of ethanol from given bond enthalpy values.



$E(\text{C-C}) = 347 \text{ kJ mol}^{-1}$, $E(\text{C-H}) = 410 \text{ kJ mol}^{-1}$, $E(\text{C-O}) = 336 \text{ kJ mol}^{-1}$,

$E(\text{O=O}) = 496 \text{ kJ mol}^{-1}$, $E(\text{C=O}) = 805 \text{ kJ mol}^{-1}$, $E(\text{O-H}) = 456 \text{ kJ mol}^{-1}$.

- (b) The following two reactions occur simultaneously in separate reaction vessels.



After 1 min, 2g of MgCl_2 has been produced in the first reaction.

- (i) How many moles of MgCl_2 are produced after one minute?
- (ii) Calculate the rate of the reaction using the amount of product that is produced.
- (iii) Assume that the second reaction also proceeds at the same rate. Calculate the number of moles of NaCl produced after 1 min and the mass (in g) of sodium that is needed for this reaction to take place. ($\text{Mg} = 24$, $\text{Na} = 23$, $\text{Cl} = 35.5$)

- (c) Use the energy diagram for the reaction of carbon monoxide and nitrogen dioxide to form carbon dioxide and nitrogen oxide to answer the following questions.

- (i) Complete the energy diagram.
- (ii) What kind of reaction is represented by this diagram, endothermic or exothermic? Give reasons.
- (iii) What does the symbol E_a represent?
- (iv) What does the symbol ΔH represent?

